NASA Langley's

Use of Beam Deflection to Control Electron-Beam Wire Deposition

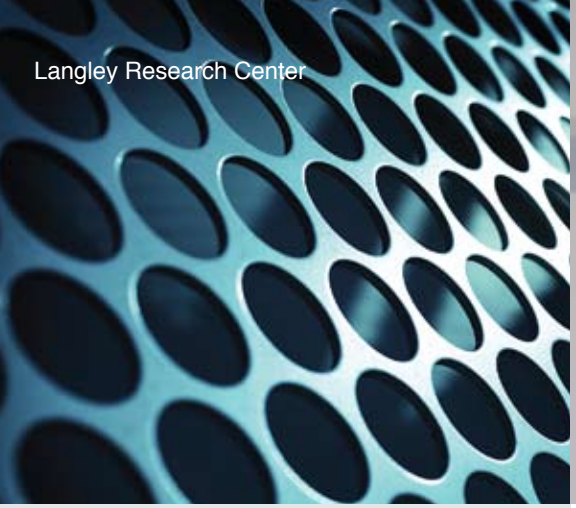
Advanced process control technique for electron-beam free-form fabrication and welding

NASA Langley researchers have a strong technology foundation in the use of electron-beam (e-beam) deposition for free-form fabrication of complex shaped metal parts. While e-beam wire deposition is of interest for rapid prototyping of metal parts, cost-effective near-net shape manufacturing, and potential use in space, it is also of intense interest for industrial welding and fabrication in a range of applications, from small components to large aerospace structures. Through significant advancements in techniques to improve control of the process, NASA greatly expands upon the capabilities of the e-beam fabrication and welding process.

Benefits

- Self-correcting – stabilizes and optimizes e-beam heating of the wire during the deposition process
- Provides continuous and predictable deposition pattern.
- Simplifies deposition of complex geometries
- Optimizes microstructural control of the solidified molten metal
- Provides efficient use of power and feedstock
- Improves automated operation

partnership opportunity



Applications

The technology offers wide-ranging market applications, including:

- Welding of metal structures for automotive, aerospace, and other industrial and commercial manufacturing
- Free-form fabrication of complex metal components in remote locations
- Near-net shape manufacturing and rapid prototyping
- Applicable to variety of metal fabrication markets, from automotive and aerospace to sporting goods and medical devices

The Technology

The technology employs rastering of the e-beam in the region of the wire and substrate melt zone. By controlling the raster pattern, the e-beam selectively heats the outer edges of the wire as it strays from the melt zone. With such selective heating, the wire automatically curls back away from the high heat outer edge and back into the region of the molten pool. Thus, with a fixed raster pattern, the process becomes self-correcting without any sensing or external control of process parameters.

For More Information

If your company is interested in licensing or joint development opportunities associated with this technology, or if you would like additional information on partnering with NASA, please contact:

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